

TRAINING CURRICULUM and LESSON PLANS

Monitoring Endorsement

**Curriculum Objectives and Sample Lesson Plans
for the EMT-F Monitoring Endorsement**

Montana Department of Labor and Industry Board of Medical Examiners

The purpose of the Monitoring Endorsement for EMT-F is to provide the EMT-F with the knowledge and skills to collect potential diagnostic values and pass that information on to the transporting entity, receiving facility, or medical control.

The Monitoring Endorsement is NOT designed for the EMT-F to interpret the results of monitored findings, or base patient care on the results of monitored findings.

Patient care should always be based on patient presentation and Montana Prehospital Treatment Protocols.

VITAL SIGNS AND SAMPLE HISTORY

COGNITIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- VS1-2.1 Identify the components of vital signs. (C-1)
- VS1-2.2 Describe the methods to obtain a breathing rate. (C-1)
- VS1-2.3 Identify the attributes that should be obtained when assessing breathing. (C-1)
- VS1-2.4 Differentiate between shallow, labored and noisy breathing. (C-3)
- VS1-2.5 Describe the methods to obtain a pulse rate. (C-1)
- VS1-2.6 Identify the information obtained when assessing a patient's pulse. (C-1)
- VS1-2.7 Differentiate between a strong, weak, regular and irregular pulse. (C-3)
- VS1-2.8 Describe the methods to assess the skin color, temperature, condition (capillary refill in infants and children). (C-1)
- VS1-2.9 Identify the normal and abnormal skin colors. (C-1)
- VS1-2.10 Differentiate between pale, blue, red and yellow skin color. (C-3)
- VS1-2.11 Identify the normal and abnormal skin temperature. (C-1)
- VS1-2.12 Differentiate between hot, cool and cold skin temperature. (C-3)
- VS1-2.13 Identify normal and abnormal skin conditions. (C-1)
- VS1-2.14 Identify normal and abnormal capillary refill in infants and children. (C-1)
- VS1-2.15 Describe the methods to assess the pupils. (C-1)
- VS1-2.16 Identify normal and abnormal pupil size. (C-1)
- VS1-2.17 Differentiate between dilated (big) and constricted (small) pupil size. (C-3)
- VS1-2.18 Differentiate between reactive and non-reactive pupils and equal and unequal pupils. (C-3)
- VS1-2.19 Describe the methods to assess blood pressure. (C-1)
- VS1-2.20 Define systolic pressure. (C-1)
- VS1-2.21 Define diastolic pressure. (C-1)
- VS1-2.22 Explain the difference between auscultation and palpation for obtaining a blood pressure. (C-1)
- VS1-2.23 Identify the components of the SAMPLE history. (C-1)
- VS1-2.24 Differentiate between a sign and a symptom. (C-3)
- VS1-2.25 State the importance of accurately reporting and recording the baseline vital signs. (C-1)
- VS1-2.26 Discuss the need to search for additional medical identification. (C-1)

AFFECTIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- VS1-2.27 Explain the value of performing the baseline vital signs. (A-2)
- VS1-2.28 Recognize and respond to the feelings patients experience during assessment. (A-1)
- VS1-2.29 Defend the need for obtaining and recording an accurate set of vital signs. (A-3)

- VS1-2.30 Explain the rationale of recording additional sets of vital signs. (A-1)
VS1-2.31 Explain the importance of obtaining a SAMPLE history. (A-1)

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- VS1-2.32 Demonstrate the skills involved in assessment of breathing. (P-1, 2)
VS1-2.33 Demonstrate the skills associated with obtaining a pulse. (P-1, 2)
VS1-2.34 Demonstrate the skills associated with assessing the skin color, temperature, condition, and capillary refill in infants and children. (P-1, 2)
VS1-2.35 Demonstrate the skills associated with assessing the pupils. (P-1, 2)
VS1-2.36 Demonstrate the skills associated with obtaining blood pressure. (P-1, 2)
VS1-2.37 Demonstrate the skills that should be used to obtain information from the patient, family, or bystanders at the scene. (P-1, 2)

LESSON PLANS:

Declarative (What)

I. General Information

- C. Chief complaint - why EMS was notified
- D. Age - years, months, and days
- E. Sex - male or female
- F. Race

II. Baseline Vital Signs

C. Breathing - assessed by observing the patient's chest rise and fall.

1. Rate is determined by counting the number of breaths in a 30-second period and multiplying by 2. Care should be taken not to inform the patient, to avoid influencing the rate.
2. Quality of breathing can be determined while assessing the rate. Quality can be placed in 1 of 4 categories:
 - a. Normal - average chest wall motion, not using accessory muscles.
 - b. Shallow - slight chest or abdominal wall motion.
 - c. Labored
 - (1) An increase in the effort of breathing
 - (2) Grunting and stridor
 - (3) Often characterized by the use of accessory muscles
 - (4) Nasal flaring, supraclavicular and intercostal retractions in infants and children
 - (5) Sometimes gasping
 - d. Noisy - an increase in the audible sound of breathing. May include snoring, wheezing, gurgling, crowing.

D. Pulse

1. Initially a radial pulse should be assessed in all patients one year or older. In patients less than one year of age a brachial pulse should be assessed.
2. If the pulse is present, assess rate and quality.
 - a. Rate is the number of beats felt in 30 seconds multiplied by 2.

- b. Quality of the pulse can be characterized as:
 - (1) Strong
 - (2) Weak
 - (3) Regular
 - (4) Irregular
 - 3. If peripheral pulse is not palpable, assess carotid pulse.
 - a. Use caution. Avoid excess pressure on geriatrics.
 - b. Never attempt to assess carotid pulse on both sides at one time.
- C. Assess skin to determine perfusion.
 - 1. The patient's color should be assessed in the nail beds, oral mucosa, and conjunctiva.
 - a. In infants and children, palms of hands and soles of feet should be assessed.
 - b. Normal skin - pink
 - c. Abnormal skin colors
 - (1) Pale - indicating poor perfusion (impaired blood flow)
 - (2) Cyanotic (blue-gray) - indicating inadequate oxygenation or poor perfusion
 - (3) Flushed (red) - indicating exposure to heat or carbon monoxide poisoning.
 - (4) Jaundice (yellow) - indicating liver abnormalities
 - 2. The patient's temperature should be assessed by placing the back of your hand on the patient's skin.
 - a. Normal - warm
 - b. Abnormal skin temperatures
 - (1) Hot - indicating fever or an exposure to heat.
 - (2) Cool - indicating poor perfusion or exposure to cold.
 - (3) Cold - indicates extreme exposure to cold.
 - 4. Assess the condition of the patient's skin.
 - a. Normal - dry
 - b. Abnormal - skin is wet, moist, or dry.
 - 5. Assess capillary refill in infants and children less than six years of age.
 - a. Capillary refill in infants and children is assessed by pressing on the patient's skin or nail beds and determining time for return to initial color.
 - b. Normal capillary refill in infants and children is < 2 seconds.
 - c. Abnormal capillary refill in infants and children is > 2 seconds.
- D. Pupils are assessed by briefly shining a light into the patient's eyes, and determining size and reactivity.
 - 2. Dilated (very big), normal, or constricted (small).
 - 3. Equal or unequal
 - 4. Reactivity is whether or not the pupils change in response to the light.
 - a. Reactive - change when exposed to light
 - b. Non-reactive - do not change when exposed to light
 - d. Equally or unequally reactive
- E. Blood pressure
 - 1. Assess systolic and diastolic pressures.
 - a. Systolic blood pressure is the first distinct sound of blood flowing through the artery as the pressure in the blood pressure cuff is released. This is a

measurement of the pressure exerted against the walls of the arteries during contraction of the heart.

- b. Diastolic blood pressure is the point during deflation of the blood pressure cuff at which sounds of the pulse beat disappear. It represents the pressure exerted against the walls of the arteries while the left ventricle is at rest.
 - c. There are two methods of obtaining blood pressure.
 - (1) Auscultation: In this case the monitoring endorsement will listen for the systolic and diastolic sounds.
 - (2) Palpation: In certain situations, the systolic blood pressure may be measured by feeling for return of pulse with deflation of the cuff.
 2. Blood pressure should be measured in all patients older than 3 years of age.
 3. The general assessment of the infant or child patient, such as sick appearing, in respiratory distress, or unresponsive, is more valuable than vital sign numbers.
- F. Vital sign reassessment
1. Vital signs should be assessed and recorded every 15 minutes at a minimum in a stable patient.
 2. Vital signs should be assessed and recorded every 5 minutes in the unstable patient.
 3. Vital signs should be assessed following all medical interventions.

III. Obtain a SAMPLE history.

C. Signs/Symptoms

1. Sign - any medical or trauma condition displayed by the patient and identifiable by the Ambulance Endorsement, e.g., Hearing = respiratory distress, Seeing = bleeding, Feeling = skin temperature.
2. Symptom - any condition described by the patient, e.g., shortness of breath.

B. Allergies

1. Medications
3. Food
4. Environmental allergies
5. Consider medical identification tag

C. Medications

1. Prescription
 - a. Current
 - b. Recent
 - c. Birth control pills
2. Non-prescription
 - a. Current
 - b. Recent
3. Consider medical identification tag

D. Pertinent Past History

1. Medical
2. Surgical
3. Trauma
4. Consider medical identification tag

E. Last oral intake: Solid or liquid

1. Time

2. Quantity
- F. Events leading to the injury or illness
 1. Chest pain with exertion
 2. Chest pain while at rest

PULSE OXIMETRY

COGNITIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- PO1-1.1 State the principles of pulse oximetry
- PO1-1.2 State the normal values for pulse oximetry
- PO1-1.3 Identify conditions which can adversely affect a patient's oxygen saturation level
- PO1-1.4 Identify conditions which can produce erroneous readings in pulse oximetry

AFFECTIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- PO1-1.5 Explain the rationale for obtaining a patient's oxygen saturation level (A-3)

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- PO1-1.6 Demonstrate the correct application of a pulse oximetry-monitoring device.
- PO1-1.7 Demonstrate obtaining a pulse oximetry reading.
- PO1-1.8 Demonstrate ability to correctly troubleshoot and correct simple problems.

LESSON PLAN:

RECOMMENDED MINIMUM TIME TO COMPLETE:

Minimum of one hour, which combines, part Lecture overview and part Skills Practice.

EQUIPMENT:

Pulse oximetry monitoring unit
Patient transducer and cable
Fingernail polish remover pad

OVERVIEW:

Emphasize to the EMT-F: Treat the patient, not the device! If the saturation level is 90% or better, maintain this oxygen saturation level with high concentration oxygen administration if there is great potential for development of a shock status!

If the saturation level falls below 90%, more aggressive oxygenation is in order.

- I. Describe the basic concept of Pulse Oximetry monitoring.
 - B. Objectively determines the oxygenation status of a patient when applied correctly.
 - C. The pulse oximeter functions by measuring, via red and infrared light, through the skin to the arterial bed. It measures the hemoglobin saturation in the bloodstream.
 - D. The reading will be expressed by percent of oxygen in patients.
 - E. Provide any patient whose saturation level is below 90% with aggressive oxygenation.
- II. Possible invalid readings
 - A. A patient with low blood flow states, (i.e., shock states, hypothermic, hypovolemia) may show an inaccurate low oxygenation percent.
 - D. A patient who has experience carbon monoxide poisoning may show a false high percent reading. In this case, the oximeter is picking up the carbon monoxide that is attached to the hemoglobin and inaccurately assuming it to be hemoglobin and oxygen.
 - E. Patients with certain anemias and oxygen capacity carrying diseases (i.e., sickle cell) may also show a false high reading. The monitor is measuring that each hemoglobin molecule is saturated but is not able to accurately note that the hemoglobin count itself is diminished.
 - F. As with all monitors - in cases with these type patients one must monitor the patient and act accordingly.
 - G. A patient with fingernail polish, excessive grease and dirt, nail-tips, or gel nails may also present with a false low reading. The infrared and red light is not able to penetrate the polish or nail endings.
- III. Placement of the transducer
 - A. Most commonly accepted place is the distal end of a finger or toe.
 - B. Pediatric pulse oximetry transducers tape around the great toe or around the heel.
 - C. The ear lobe is also an acceptable area.
 - D. The pediatric transducer may also be taped across the bridge of the nose of an adult patient. This is especially useful in patients with bad circulation to distal extremities.
 - E. Prior to placing the transducer onto a nail bed, remove excessive dirt, grease, or nail polish. If possible remove any nail tips.
- IV. Obtaining a reading.
 - A. Once the transducer is placed and the monitor turned on, the monitor will start sensing a pulse reading. Once the pulse the monitor senses the pulse, the oxygen saturation will be expressed in a percent fashion.
 - B. The patient must have a palpable pulse before using the monitor.
- V. Trouble shooting for simple errors.
 - A. Not detecting a pulse
 - 1. Patient does not have a pulse
 - 2. Transducer not applied to patient
 - 3. Transducer not able to read through nail polish, etc.
 - 4. Patient cable not connected to monitor
 - 6. Monitor not turned on
 - 7. Low battery

- B. Continuous alarm sounds
 - 1. Alarm limits set too low
 - 2. Alarm limits set too high

SKILL SEQUENCE:

1. Remove excessive grime or polish from finger (if that is the applicable sensing area)
2. Apply the transducer correctly.
3. Connect patient transducer cable to monitor.
4. Turn monitor on.
5. Obtain reading.
6. Troubleshoot any simple errors.

GLUCOMETRY

COGNITIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- G1-1.1 State the principles of blood glucose testing
- G1-1.2 State the normal values for blood glucose levels
- G1-1.3 Identify conditions which can adversely affect a patient's glucose level
- G1-1.4 Identify conditions which can produce erroneous readings in blood glucose

AFFECTIVE OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- G1-1.5 Explain the rationale for obtaining a patient's blood glucose level

PSYCHOMOTOR OBJECTIVES

At the completion of this lesson, the monitoring endorsement student will be able to:

- G1-1.6. The student shall appropriately obtain a blood specimen for testing purposes.
- G1-1.7 The student shall obtain a blood glucose level reading.
- G1-1.8 The student shall appropriately dispose of all sharps while adhering to Body Substance Isolation (BSI) procedures.
- G1-1.9 The student shall be able to correctly troubleshoot and correct simple problems.
- G1-1.10 The student shall be able to follow manufacturer and later developed service specific preventive maintenance procedures related to the monitoring device.

LESSON PLANS:

RECOMMENDED MINIMUM TIME TO COMPLETE:

Minimum of one hour, which includes, part Lecture and part Skills practice time.

EQUIPMENT:

Blood glucose monitoring unit (glucometer)
Alcohol pad
Dry sterile dressing bandage (Band-Aid)
universal precautions
lancet (or other piercing device)
test strips

OVERVIEW:

- I. Describe the basic concept of glucose monitoring.
 - A. Patient assessment
 1. Patient exhibits altered level of consciousness of suspected diabetic/hypoglycemic origin or unknown cause.
 - a. Disorientation to time, location, events, or people or
 - b. Responsive to persistent verbal or painful stimuli with inappropriate words/sounds or
 - c. Unresponsive (coma) or
 - d. Seizures/tremors.
 - e. Rule out possibility of head trauma or cerebrovascular accident
 - B. The goal of obtaining a specimen is to get an accurate blood glucose concentration.
 - C. The blood concentration is read in milligrams of glucose per deciliter (mg/dL) of whole blood.
- III. Obtaining a specimen.
 - A. Assemble needed equipment
 1. Blood glucose monitoring unit
 2. Alcohol prep
 3. Dry sterile dressing
 4. Bandage
 5. Lancet (or other piercing device)
 6. Test strip
 8. Universal precautions
 - B. Turn on machine and perform any initial start up or calibration procedures as directed by the manufacturer (especially if after cleaning the meter, if the meter has been dropped, or if the results do not reflect how the patient feels or when results are suspected to be inaccurate). For example:
 1. Check Strip Tests
 2. High/Low Calibration Tests
 - C. If available, wash the patient's hands with soap and water and dry thoroughly. Warm water stimulates the blood flow to the fingers making it easier to obtain a sample.
 - D. Select and prepare the site. The distal tip of any finger may be used. However, the preferable ones are the second (next to the forefinger) and third (next to the "pinky") fingers. **NOTE***: Scar tissue may be present if the patient continually pricks the same finger for personal monitoring. Also, someone who has very calloused fingertips may present difficulty in obtaining a good blood sample. If unsuccessful on first try, it may be best not to waste time on attempting to get a sample, but **concentrate on other interventions and transporting the patient to the hospital! "TREAT THE PATIENT, NOT THE DEVICE"**
 1. Have the patient hang their arm down to the side for 10 - 15 seconds before the stick.
 2. If using alcohol prep, make sure fingertip is allowed to dry completely before performing the finger stick.

- E. Hold the lancet or other needle device firmly on the side (“off-center” in the fleshier part, not the bony side) of the patient’s fingertip. The greater the pressure of the needle device against the finger, the deeper the puncture.
 - 1. If the needle device has a trigger mechanism - press release.
 - 2. If using a “lancet” type needle only, hold the device close to the fingertip area and quickly jab into the finger.
 - 3. Gently squeeze the finger to obtain a large, hanging drop of blood.
 - Note* A more accurate sample is usually obtained if the first drop is wiped away with a clean 2X2 gauze square or similar dry wipe, and use the second drop of blood for analysis.**
- F. Apply the drop of blood from the patient’s finger directly to the Test Spot of the Test Strip, or pick up the drop of blood with a capillary tube. Always use a new Test Strip for each blood specimen - never reuse a Test Strip.
 - 1. If the capillary tube is open at both ends
 - a. First slide a bulb over one end
 - b. Hold the capillary tube horizontally and touch the open end to the drop of blood
 - c. The blood will flow into the tube by capillary action
 - d. With the end of the tube containing the blood positioned over the Test Spot, squeeze the bulb gently to expel a shiny drop of blood with no air bubbles
 - 2. If the capillary tube is plastic and closed at one end
 - a. Squeeze the tube or bulb, and hold the tube horizontally while touching the open end to the drop of blood
 - b. Gently release pressure on the tube or bulb to draw up the blood
 - c. With the end of the tube containing the blood positioned over the Test Spot, squeeze the bulb gently to expel a round shiny drop of blood with no air bubbles. Dispose of the sharp in an appropriate container.
- H. Apply the sterile dressing to the tip of the finger. Once bleeding has stopped, apply a bandage (Band-Aid) to the tip of the finger.
- I. The glucometer will then display the glucose concentration. Follow manufacturer’s guidelines for test results.

III. Trouble shooting

- A. Most often, each manufacturer will list in the operator’s book, a key to error messages that the machine may display. Follow the manufacturer’s guidelines to correct.
- B. Some common errors:
 - 1. Insufficient blood specimen to cover Test Spot
 - 2. perform stick from beginning again with a new Test Strip
 - 3. Using Test Strips not coded for that particular machine
 - 4. follow manufacturer’s guidelines for changing code in
 - 5. machine, then perform stick from beginning with new Test
 - 6. Test Strip is not inserted correctly
 - 7. perform stick from beginning again with a new Test Strip
 - 8. Expired or otherwise defective Test Strips (it is not recommended to use a bottle of Test Strips that was opened for the first time more than 4 months)
 - a. Obtain new bottle of Test Strips

5. Air bubbles in the specimen on the Test Spot
 - a. perform stick from beginning again with a new Test Strip
6. The Test Strip moved out of the correct position during the test
 - a. remove Test Strip and perform stick from beginning again with new Test Strip
7. The glucometer is set in the neonatal mode with non-neonatal blood being tested and vice versa
 - a. reset the glucometer to match the blood sample

IV. General Precautions and Limitations

- A. Do NOT use plasma or serum sample, as results will be inaccurate. If using venous blood collected in a tube, make sure that the red cells are thoroughly mixed and adequately reoxygenated prior to testing. Plasma/serum results are 10% higher than corresponding whole blood tests. Do NOT use specimens collected using fluoride as a preservative (gray topped tubes).
- B. Venous blood samples must be adequately oxygenated (pO₂ greater than 45 mm Hg) to ensure accurate results.
- C. Shock administration of vasoactive agents, and other factors that decrease peripheral circulation may cause capillary blood glucose results to differ from venous or arterial results. Therefore, venous or arterial samples may be preferred.
- D. Non-neonatal samples with hematocrits below 25% or above 60% may result in inaccurate blood glucose readings.
- E. Store Test Strips in a cool, dry place below 86°F (30°C). Use caution when interpreting neonatal blood glucose results less than 50 mg/dL. Results may be inaccurate if neonatal sample hematocrits are less than 25% or more than 76%. All neonates exhibiting hypoglycemic symptoms should have their glucose concentrations confirmed by lab methods regardless of monitor results.
- F. If patient's symptoms are inconsistent with monitoring results and procedural errors are ruled out, follow your protocol for treating the symptoms. Blood glucose concentrations measure with a glucometer may be significantly lower than the true level if significant water loss and dehydration has occurred. This results because severe dehydration can cause increased blood viscosity and interfere with the penetration of the sample into the Test Spot and lead to inaccurately low results. Because severe dehydration is also associated with development of the hyperglycemic-hyperosmolar state (with or without ketosis), a potentially life threatening acute complication of diabetes, factors which cause it must be considered. For example:
 1. Sustained uncontrolled diabetes
 2. Vomiting or diarrhea
 3. Prescription drugs such as diuretics
 4. Shock (severe hypotension)

V. Normal lab values:

- A. Adult 70 - 110 mg/dL
- B. Neonatal 30 - 60 mg/dL (****All neonates exhibiting hypoglycemic symptoms, regardless of blood glucose screen results, should have glucose levels confirmed by a laboratory test.*)

SKILL SEQUENCE:

1. Patient assessment
2. Assemble equipment
3. Prepare glucometer
4. Select and prepare site
5. Perform finger stick (**EMT-B should have BSI precautions in place prior to actually sticking finger)
6. Place adequate drop of blood on Test Strip
7. Obtain blood glucose concentration measurement
8. Dispose of sharps
9. Place dressing and bandage ("Band Aid") on finger stick site